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ON

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DETERMINATION OF THE DIP EQUATOR USING THE SATELLITE EXPLORER XX

by

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During the daytime, the h'(t) traces on the Explorer XX records (Calvert, Knecht, and VanZandt, 1964) often exhibit a hump near the dip equator (Fig. 1). When the hump is symmetrical, it is likely that the center of symmetry of the hump is at the local dip equator. This would be true if the plasma were in diffusive equilibrium along the field lines. Any process which might move the center of symmetry by perturbing diffusive equilibrium would make the hump asymmetrical.

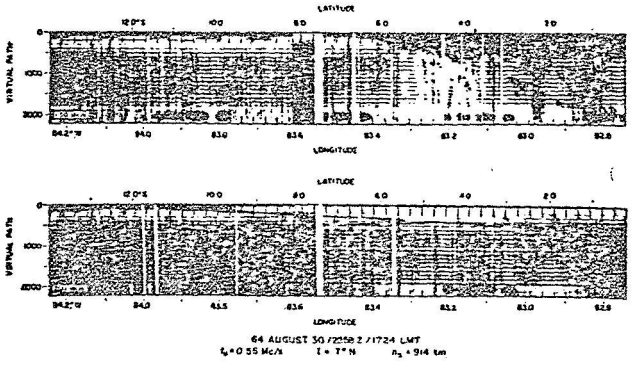

Fig. 1 — Explorer XX records on 1.50 and 2.00 MHz. The time delay τ (expressed in vertical path = $c\tau/2$ km) is measured downwards from the top of the records. The horizontal scale is time or geographical position. These records are four minutes long. The center of symmetry of the equatorial ionosphere is on the left at a latitude of about 12°S, as indicated by the z-trace in the upper record and the x-trace in the lower one.

From Explorer XX data obtained in September 1964, eight determinations of the center of symmetry have been made (Fig. 2). On these occasions the satellite was between about 900 and 1000 km. These locations of the dip equator agree well with recent spherical harmonic analyses of the field. There remains a small discrepancy (0.3°-0.4° of latitude), but the number of points are two few and their error bars are too large to say whether the Explorer XX determinations may be more accurate than the spherical harmonic analyses.

The movement of the center of the hump when the hump is asymmetrical may be of use in studying the perturbations of diffusive equilibrium, that is, in inferring the velocity of plasma flow across the equator.

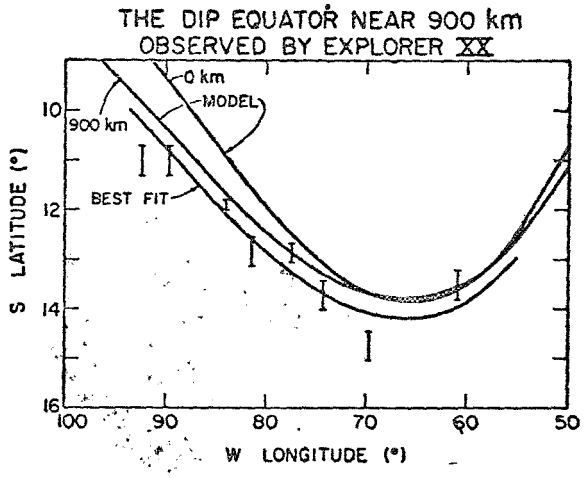

Fig. 2 — Shown are eight points determined from Explorer XX records, the dip equator at 0 and 900 km computed with Cain's 1965 spherical harmonic coefficients, and a "best fit" to the Explorer XX data, obtained by moving the 900 km curve 04° southward.